

INFECTIOUS MULTIPLE GANGRENE OF THE SKIN.¹

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THE recorded cases of multiple gangrene of the skin include two distinct varieties which differ considerably in their clinical features and are widely separated pathologically. Doutrelepon, Kaposi, Renaut, Bayet, Duhring, and others have reported cases under various names, occurring for the most part in nervous or hysterical women, which were, without doubt, trophoneurotic in nature. In these the cutaneous lesions were usually flaccid vesicles or bullæ, less frequently pustules, occurring in some instances in more or less well-defined groups, followed in a short time by gangrene of the skin, as a rule, superficial in extent, but in exceptional cases causing extensive losses of tissue. The course of the disease was commonly irregular, now better, now worse, lasting from a few months to several years. In a much smaller number of cases an infectious origin has been demonstrated by the finding of special micro-organisms in the lesions which culture and inoculation experiments proved to be pathogenic; or their infectious nature has been reasonably inferred from their symptoms and course.

The following case presents a somewhat unusual type of infectious gangrene of the skin, being characterized by some clinical and bacteriological features not noted in those hitherto reported :

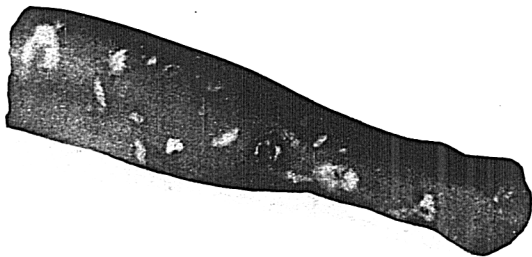
Mrs. H. B., aged forty-six years, the wife of a farmer ; pale and somewhat emaciated ; was first seen in August of this year, through the courtesy of Dr. Zook, of Newville, Pa., under whose care she had been for three or four years. At the time of this first examination there were present upon the arms and legs six or eight perfectly round, deeply excavated, sharply circumscribed ulcers, and innumerable very white, mostly circular, smooth, slightly depressed scars varying in size from a pea to a silver dollar. Upon the right shoulder over the deltoid muscle was an especially large ulcer, two and one-half or three inches in diameter and extending down to the superficial fascia, the large size of this lesion being due to the fact that it had been allowed to pursue its course without treatment of any kind for three or four weeks. Some of these ulcers presented healthy granulating surfaces ; others were covered with grayish or black moist sloughs.

Five weeks later the patient again came under observation in the wards of the Methodist Hospital of this city, to which she had come for the further study and treatment of her malady. Upon her admission to the hospital there were present a number of lesions in various stages of development or involution, a few upon the trunk, but the majority upon the arms and legs. Upon the upper part of the chest were four circular,

¹ Read before the College of Physicians of Philadelphia, January 5, 1898.

thick, black crusts, beneath which were shallow, granulating ulcers about an inch in diameter. About the centre of the flexor surface of the left forearm was a pea-sized, oval, black eschar, surrounded by an elevated vesicular ring an eighth of an inch wide, about which was a dark-red

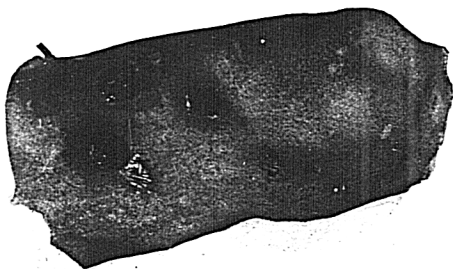
FIG. 1.



Infectious multiple gangrene of skin. Vacciniform lesion on left forearm, about one week old. Numerous scars from old lesions.

inflammatory areola, the whole bearing a close resemblance to vaccinia just before the contents of the vesicle become purulent. This lesion was the seat of considerable pain, and was very firm and tender to the touch (Fig. 1). On the inner surface of the left thigh, about six inches below Poupart's ligament, there were three circular ulcers an inch or more in

FIG. 2.



Infectious multiple gangrene of skin. Ulcerating lesions on inner surface of left thigh.

diameter, two of which were clean and granulating, while the third and largest was surrounded by an elevated border quite firm to the touch, on top of which was a flat, ill-defined, vesicular ring, the bottom being covered with a grayish, loosely adherent slough; this ulcer was also extremely painful (Fig. 2). Upon the left leg were several shallow

healthy ulcers which were rapidly healing; these had been the seat of gangrenous lesions which had been excised before the patient's admission to the hospital. As has already been mentioned, there were, in addition to these active lesions, numerous scars, the sites of former ones upon the chin, upper part of the chest, and upper and lower extremities. It is worth noting that the lower part of the chest, the abdomen, and the entire back were entirely free from evidences of disease past or present. The early history of the affection was briefly as follows: Four years ago the patient ran a meat-hook, which had been in use for some time, under the nail of the third finger of the right hand; shortly after this injury a painful spreading ulcer formed in this situation, which was followed by a second just above the right internal malleolus, the disease spreading thence to the parts of the body already noted. Since the appearance of the first ulcer the patient has never been free from the malady. Some two or three years ago an unusually virulent and destructive lesion appeared under the nail of the left thumb, for which the terminal phalanx of that member was amputated by her medical attendant, all other means taken to prevent the spread of the ulcer having been without avail. During her stay in the hospital new lesions made their appearance almost daily, at first upon the flexor surface of the forearms, later upon the inner surface of the right thigh. They began either as small, pale-red, slightly elevated papules which within a very few hours were replaced by pin-head-sized, flaccid vesicles capped by a small black crust, or they were vesicular from the beginning, with a minute black or brown crust upon the summit. They grew rapidly, attaining the size of a large pea within twenty-four hours; the central black eschar became depressed as it enlarged, and the whole lesion after two or three days resembled closely a vaccination vesicle six to eight days old. Unless excised or destroyed in some manner they continued to enlarge in all directions, the borders being very firm to the touch, while the centre was occupied by a constantly growing, dry gangrenous mass, which was in time loosened by suppuration occurring beneath it. It should be remarked here that this suppuration was evidently a secondary process, appearing only after the eschar had reached a considerable size. There was remarkable uniformity in the character of the lesions. As has already been mentioned, for the first few days they were vaccini-form in appearance; after the separation of the central eschar they became sharp-cut, round ulcers with elevated firm borders, spreading in depth and circumference, the bottom covered by a grayish or black slough. Although the disease was not attended by any constant general disturbance, the patient was subject to occasional attacks of severe chills followed by elevation of temperature—sometimes amounting to as much as 104° F.—and diarrhœa, these rarely lasting more than a day or two.

Microscopical examination of a number of excised lesions varying in age from twenty-four hours to five days showed that the disease involved the entire thickness of the skin. In the centre of the lesion the epidermis was transformed into a homogeneous, uniformly staining mass, which blended insensibly with the corium beneath; upon the sides it was lifted bodily from the papillary layer, forming cavities filled with small quantities of coagulated fibrin, degenerating epithelium, and cellular débris. The entire thickness of the corium was occupied by numerous hemorrhages and an enormous number of lymphoid cells, except in the

centre of the lesion, where it had been changed into a mass in which formed elements were no longer distinguishable; in the older lesions

FIG. 3.



Section of day-old lesion containing numerous bacilli.

FIG. 4.



Same as Fig. 3, high power.

the papillary layer was completely disintegrated. Far more interesting and significant, however, was the finding of great numbers of bacilli in the lowest layers of the rete and in the papillary and sub-papillary portions of the corium, where their growth had resulted in the almost complete destruction of the tissues. These micro-organisms occurred scattered about irregularly or in considerable masses, resembling morphologically the bacillus tuberculosis, staining best with gentian violet employed after the method of Weigert; all other methods and stains tried either failed completely to stain them or gave very inferior results. Beside this bacillus the ordinary staphylococcus pyogenes aureus was present in large numbers. (Figs. 3 and 4.)

The absence of any constitutional symptoms indicating a general infection, and the superficial situation of the bacilli in the early stages of the disease seemed to justify the assumption that the malady was a local one; the limitation of the eruptive lesions to those parts of the body easily accessible to the fingers of the patient suggested the probability that new lesions arose by autoinoculation. Acting upon these assumptions an effort was made to destroy the micro-organisms in the lesions by early intradermic injections of a 5 per cent. solution of potassium permanganate, this agent being chosen, not because it was regarded as the most effective bactericide, but because it could be introduced into the skin in sufficient quantities without danger of undesirable general effects from its absorption. In addition to these injections the skin was to be washed frequently with a 1:1000 solution of mercuric bichloride. Four lesions were injected with the permanganate solution a few hours after their appearance, with the effect of materially retarding their development, but the patient left the hospital too soon to determine whether they were completely aborted. Various forms of treatment had been tried before the case came under my care, but the only effective one had been excision. When the lesions were thoroughly excised, together with a considerable margin of sound skin, the wound thus made rapidly healed; if, however, all of the infected tissue was not removed, as happened frequently, the wound speedily became a steadily enlarging gangrenous ulcer with firm elevated borders, precisely like those which resulted from untreated lesions.

In most of the cases of infectious gangrene of the skin the disease commenced as an eruption of papules, vesicles, or pustules, usually small in number, which enlarging were transformed into eschars, beneath which circular, more or less deeply penetrating ulcers with a marked tendency to spread, occurred. The infectious variety is rarely so prolonged in its course as the trophoneurotic form, but that there are exceptions to this rule is proven by the case just reported. Severe constitutional symptoms, such as high temperature, delirium, extreme prostration, have occurred in a considerable proportion of the cases; in one case the disease terminated fatally.

Multiple gangrene may occur as a complication or sequel of some other acute infectious malady. Demme¹ has reported two cases of this character occurring in children who were the subjects of a severe attack of erythema nodosum, which was apparently contagious, since three children of one family were attacked by it at short intervals. The erythema was accompanied by chills, high temperature—40.2° C.—vomiting, and extreme pains in the legs and arms. One week after the beginning of the attack vesicles, which shortly became pustules, appeared upon the lesions of the erythema, and these in turn were transformed into gangrenous sloughs. A bacillus was found in the lesions, which when cultivated and inoculated into guinea pigs produced a gangrene of the skin like that observed in the children.

Three cases of gangrene of the skin complicating measles have been reported by Mensi.² In the gangrenous lesions were found the staphylococcus pyogenes aureus, a bacillus culturally and morphologically like the proteus vulgaris, and a bacterium resembling the diphtheria bacillus of Loeffler. Inoculation of guinea-pigs with bouillon cultures of the first two produced ulceration like that from which they were originally obtained.

Under the title "A New Species of Gangrene of the Skin with the Formation of Pustules," Rotter³ has reported a case of gangrene affecting a considerable area of the skin of the leg, which at the end of the second week was associated with an eruption of large hemorrhagic pustules, which continued to appear for fifteen months. From pus from the ulcerating surface and the pustules a bacillus was cultivated, which by reinoculation produced upon the patient lesions like the original ones.

Welsch⁴ has recently published a fatal case of cutaneous gangrene occurring in the person of a man who was addicted to the use of morphine hypodermatically, the initial lesion appearing at the site of an injection. From the lesions, which began as abscesses but later became gangrenous ulcers, a bacillus was cultivated which was markedly pathogenic. Simon⁵ has likewise reported a case of abscesses and gangrene occurring in a young woman, a victim of the morphine habit; when deprived of her syringe the disease disappeared, but returned when she got possession of it again. Although no micro-organisms were found in this case—probably because they were not looked for—the probabilities are greatly in favor of its being etiologically identical with the one reported by Welsch. As multiple cachectic gangrene, Eichhoff⁶ has published a case occurring in a child one and one-half years old, in which, two weeks after an attack of measles, an eruption of dark-red spots, blebs with cloudy contents, and deep ulcers with sharp-cut bor-

¹ Fortschritte der Medicin, 1888.

² Dermatologische Zeitschrift, 1895.

³ Breslauer aerztliche Zeitschrift, 1879.

⁴ Gazzetta Med. de Torino, 1894.

⁵ Archiv f. Dermatologie und Syphilis, Bd. xxxix.

⁶ Deutsche medicinische Wochenschrift, 1884.

ders, appeared. Many of the ulcers were covered with dry, black eschars. There was also a marked conjunctivitis with swelling of the lids and purulent secretion. Microscopical examination of material obtained from the bottom and edges of the ulcers revealed a quantity of fungus corresponding in size and appearance with the trichophyton tonsurans, the quantity of mycelium being remarkable. The conjunctivitis was also mycotic. Eichhoff believes that two cases presenting similar clinical features, which he had seen some time previously, and one of which he had reported as an example of cachectic gangrene, were due to the same cause.

In addition to the foregoing cases, in which the presence of a pathogenic micro-organism was positively demonstrated, there remains a small number in which the clinical features of the disease correspond so closely with those of proven infectious nature that they may reasonably be included in the same category, although no micro-organisms were found in them. Hallopeau and Le Damany¹ have described a case characterized by the development of red nodules in the centre of which a yellowish crust formed after loosening of the epidermis; beneath this crust ulcers with sharp-cut, perpendicular edges and covered with putrilaginous detritus appeared, which enlarged peripherally. Some of these lesions remained superficial and healed rapidly, others became covered with a dry black eschar, or becoming markedly indurated extended into the deeper parts of the skin. Along with these ulcerative lesions the lymphatic glands suppurated, giving rise to necrotic ulcerations. The buccal and guttural mucous membranes were affected as well as the skin. The authors reject the idea of a trophoneurosis in this case, but believe the malady to have been infectious, the lesions multiplying by autoinoculation.

Boeck² has published the details of a case of multiple gangrene in a child, ten months old, which began as red, slightly elevated spots upon the back, breast, scalp, and upper extremities, upon the summits of which vesicles quickly appeared. When these vesicles reached a certain size the centre became depressed and a brownish crust formed, the lesion at this stage resembling closely vaccine pustules nine or ten days old. The crust continued to enlarge until it included the whole lesion, not being simply dried epidermis, but formed by a more or less deep gangrene of the corium. Numerous micrococci were found, but, as these did not differ from those present in all inflammatory foci in the skin, no special significance was attached to them.

Janovsky and Mourek³ have quite recently published a case of cutaneous gangrene which began with an eruption of flat, pale-red, hard

¹ Annales de Dermatol. et de Syphilis., 1895.

² Archiv f. Dermatol. u. Syphilis, 1882.

³ Archiv f. Dermatol. u. Syphilis, Bd. xxxv. 1896.

and elastic papules surrounded by a red border. Some of these after enlarging disappeared, leaving the skin slightly pigmented and scaling; others became covered in the centre with a brown or blackish, lamellated, tightly adherent eschar, beneath which was an ulcer with slightly elevated border and steep sides. Repeated examinations of the secretions beneath the crusts and of the blood failed to reveal any micro-organisms. Notwithstanding the failure to find these, the authors do not reject the infectious origin of the malady, since disease of the blood-vessels, syphilis, or other constitutional disease was not present, and the most careful examination of the nervous system failed to discover any ground for belief in its trophoneurotic nature.

Lastly, I would include among the cases of infectious gangrene those of varicella gangrenosa, of which a considerable number have been reported since Mr. Hutchinson first called attention to the malady.

THE CLINICAL SIGNIFICANCE OF REDUPLICATION OF THE HEART-SOUNDS.

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PERSONAL OBSERVATIONS. It is curious how all but the grosser physical phenomena escape a clinical observation which has not the habit of noting the apparently unessential as well as manifestly important occurrences. The present writer failed to notice reduplication of the heart-sounds in normal subjects until about four years ago, when, on theoretical grounds, it seemed that there should be perceptible doubling of the second sound of the heart, and, on looking for it, the phenomenon was observed. This sound-character was, for a while, casually noted as a physiological curiosity, but, ere long, observation seemed to show that its study might lead to results of importance to both the physiologist and the clinician. At all events, it appears that much of the confusion in the explanation of the physical signs arising from pathological conditions of the circulation is abolished by the views here presented. In this study it was soon found that attention could not be restricted to the comparatively simple phenomenon of reduplication of the second sound, for the much more difficult task frequently presented itself of explaining the reduplication of the first sound of the heart. Here, too, there seems reason to believe that the conclusions are not without importance. The present work, like all that has gone before it, too often suffers from the necessity of leaving, as final, theoretical explanations which are unfounded on physiological demonstration and which, from the nature of the phenomena, cannot be proved by post-

mortem findings. It is, nevertheless, an attempt to apply known facts of physiology to the solution of problems arising from the clinical study of the heart.

REDUPLICATION OF THE FIRST SOUND OF THE HEART. *Grades of reduplication.* Reduplication of either heart-sound may have every possible degree of completeness. The normal first sound of the heart may be graphically represented as a curve, like the familiar curve of muscular contraction, rising from a base line gradually to a maximum and then as gradually declining. The first approach toward reduplication is manifested in a prolongation of the period during which the curve maintains its maximum height. The next grade witnesses a slight depression in the highest part of the curve—that is, the first sound has two maxima separated by an interval of less intense sound. In a selected series of cases the notch in the sound-curve may be represented as cutting deeper and deeper until, in certain instances, the curve is completely divided, and we have the normal single first sound split into two sounds separated by an interval of silence. This latter phenomenon is comparatively rare, and probably is usually, if not always, the result of some morbid anatomical change, such as the existence of pericardial adhesions. But incomplete splitting of the first sound, particularly of the slight grade in which two maxima are barely noticed in it, is a common phenomenon. Potain, as quoted by Sansom, considers that doubling of the first sound can be detected in at least one-fifth of healthy subjects, whereas Sansom and some others think it a fact of great rarity. In 205 cases in which I have noted the presence or absence of reduplication, the first sound is recorded as being split or doubled in thirty-five cases. In only two or three of these subjects was the first sound completely divided by an interval of silence. It should be remarked that the lower pitch and longer duration of the first sound of the heart render the recognition of its reduplication much less easy than in the case of the second sound, whose maxima are separated by the same interval.

Difference between real and simulated reduplication of the first sound. It is a happy phrase by which Sansom characterized many cases of reduplication as due not to real repetitions of the normal sound-producing process, but to abnormal events which cause sounds *simulating* the normal cardiac sounds. In the subsequent consideration of the second sound of the heart no difficulty will be experienced in separating real from simulated reduplications. But difficulties arise in considering the first sound from the lack of certain physiological knowledge as to the causes of that sound. It will, for convenience, be here assumed that the first sound of the heart is purely muscular in origin, without in the least denying that, under normal conditions, the sound owes part of its intensity to vibration of the auriculo-ventricular valves or the